

First Record of the Family Peltidiidae (Copepoda; Harpacticoida) from the Gulf of Mexico, with the Description of a New Species of *Peltidium*

Carlos Varela^{1*} and Samuel Gómez²

¹Department of Biological Sciences, Florida International University, 3000 N.E. 151st Street, North Miami, Florida 33181, U.S.A.

²Universidad Nacional Autónoma de México, Instituto de Ciencias del Mar y Limnología, Unidad Académica Mazatlán, Joel Montes Camarena s/n, 82040, Mazatlán, Sinaloa, México

Abstract.—Female harpacticoid copepod specimens representing an undescribed species of *Peltidium* (Peltidiidae) were found from an unidentified species of *Sargassum* during a series of samplings carried out in 2014 in Tampa Bay, Florida, U.S.A. The new species, *Peltidium camilae*, is similar to *P. nichollsi* Geddes, 1968 and *P. lernerri* Geddes, 1968. These species share the female exopod of leg 5 with two inner and three apical setae, the second endopodal segment of leg 1 with three setae, and the third endopodal segment of legs 2–4 with three, five and four setae, respectively. *Peltidium camilae* n. sp. can be distinguished from *P. nichollsi* and *P. lernerri* by having a shorter endopod relative to the exopod on legs 2–4, apical claws on the terminal exopodal segment of leg 1 that are as long as the first exopodal segment of leg 1, and subequal middle and inner apical setae on the exopod of leg 5. This is the first record of the family Peltidiidae from the Gulf of Mexico.

The family Peltidiidae (Copepoda; Harpacticoida) contains mainly marine algal-dwellers able to cope with strong water flows over flat surfaces thanks to their flattened bodies (Boxshall and Halsey 2004; Song et al. 2015). The family is composed of eight genera (Boxshall and Halsey 2004), of which *Peltidium*, with 28 valid species, is the most speciose (Varela 2005; Wells 2007; Suárez-Morales and Jarquín-González 2013; Varela and Gómez 2013). Members of *Peltidium* have been recorded from all but the polar seas (Song et al. 2015). However, this group of harpacticoid copepods has not been reported from the Gulf of Mexico (Suárez-Morales et al. 2009; Song et al. 2015). As part of a field trip with students to learn about the marine biodiversity of the west coast of Florida, washings of an unidentified species of *Sargassum* C. Agardh, 1820 (Ochrophyta; Sargassaceae) were examined for harpacticoid copepods. Here we present a new species, *Peltidium camilae*, found in those macroalgal washings from Tampa Bay, Florida.

Materials and Methods

Samples of *Sargassum* sp. were collected at 1.5 m depth while SCUBA diving and were then placed in a resealable polyethylene bag. In the laboratory, several drops of formalin were added to the bag and then the content was shaken vigorously to detach the copepods from the macroalgae. The washings were poured through a 300 µm sieve, and then the sieve

* Corresponding author: varela06@gmail.com

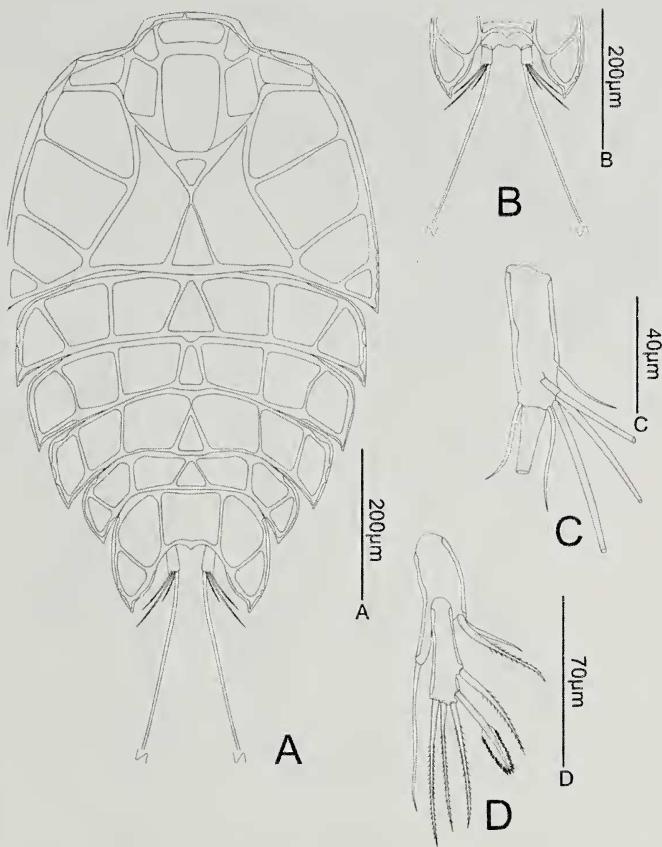


Fig. 1. *Peltidium camilae* n. sp., adult female. (A) Habitus, dorsal view; (B) Urosome showing posterior end of the genital double-somite, the anal somite, and caudal rami, ventral view; (C) Caudal ramus, dorsal view; (D) Leg 5.

contents were transferred to a petri dish filled with water from which copepods were manually separated from the debris at 60 \times magnification using a Wild M5 stereomicroscope. Observations and drawings of whole specimens and dissected appendages were made with the aid of a Leica CME microscope equipped with a drawing tube. The type material was deposited in the Florida International Crustacean Collection (FICC) at Florida International University (FIU). Abbreviations used in the text are: EXP, exopod; END, endopod; and P1-P5, legs 1-5.

Results

Peltidium camilae n. sp. (Figs. 1-3)

Type material. One ovigerous female holotype (HBG 8001) and one dissected, non-ovigerous female paratype (HBG 8002) preserved in 75% ethanol, February 14, 2014, ex *Sargassum* sp., 1.5 meters depth, col. C. Varela.

Type locality. Tampa Bay, Florida, U.S.A. (27°32'N, 82°44'W).

Description of adult female. Body (Fig. 1A) broad, dorsoventrally flattened, arched along longitudinal axis, strongly chitinized, and tapering posteriorly. Total body length

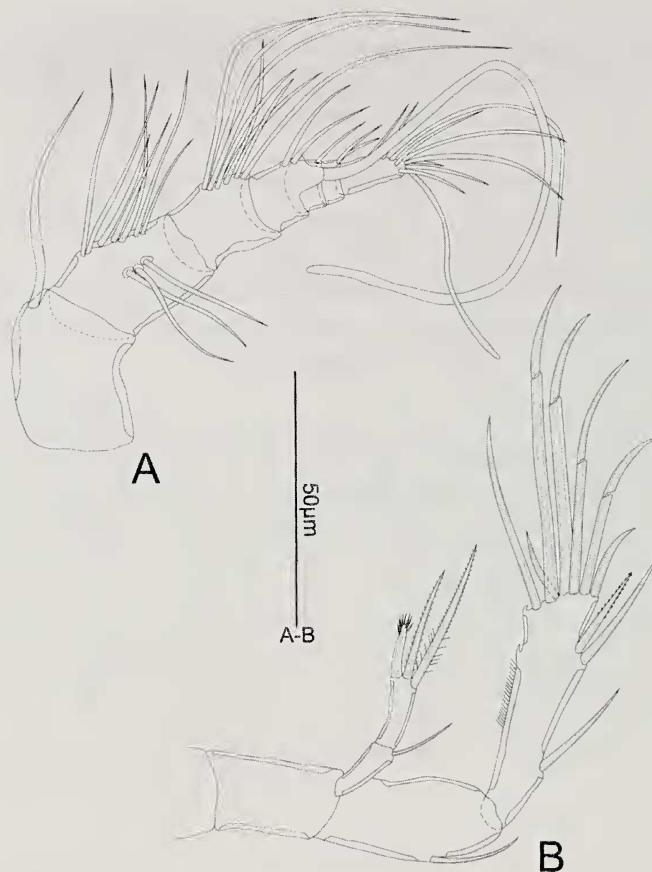


Fig. 2. *Peltidium camilae* n. sp., adult female. (A) Antennule; (B) Antenna.

measured from tip of rostrum to posterior margin of caudal rami ranging from 0.90 mm for the paratype to 1.05 mm for the holotype (mean = 0.98 mm); greatest width at posterior part of cephalothorax. Cephalothorax accounting for about half of body length; rostrum broad. Epimera of somites pointed and posteriorly directed. Urosome comprising P5-bearing somite, genital double-somite, and anal somite (Fig. 1B). Genital double-somite well developed, wider than long, with posterolateral corners reaching well beyond posterior margin of caudal rami. Each ramus (Fig. 1C) about 3 times as long as wide, slightly tapering distally, with 7 setae located on distal third; setae I and VI shortest, subequal in length.

Antennule (Fig. 2A) 7-segmented; segment 2 longest, segment 6 shortest. Armature formula: 1-[1], 2-[10], 3-[8], 4[2+ae], 5-[1], 6-[2], 7-[9+ae].

Antenna (Fig. 2B) with small coxa. Basis without abexopodal seta. Exopod 2-segmented, elongated; first segment with short, slender inner seta; second segment with 3 setae distally, of which smallest seta pectinate apically. Endopod 2-segmented; first segment shorter than second, with 1 inner seta; second segment with outer row of long spinules, 1 proximal seta, 1 spine and 1 seta subdistally along inner margin, and 7 apical elements, 4 of them geniculate.

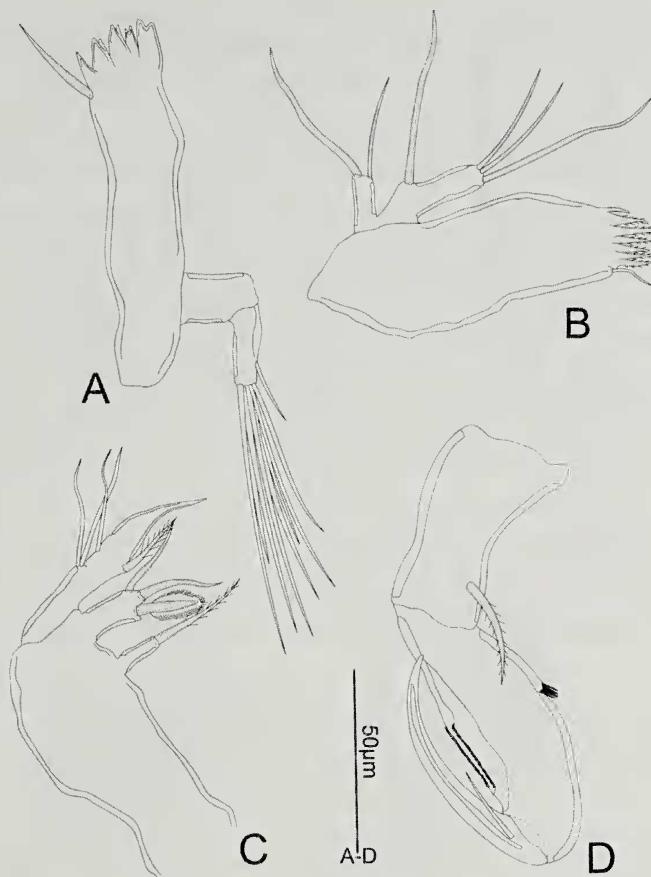


Fig. 3. *Peltidium camilae* n. sp., adult female. (A) Mandible; (B) Maxillule; (C) Maxilla; (D) Maxilliped.

Mandible (Fig. 3A) with long, slender coxa. Gnathobase with 1 stout seta and 4 bicuspide and 1 monocuspide teeth. Mandibular palp small, uniramous; basis unarmed; endopod 1-segmented with 1 lateral and 8 distal setae.

Maxillule (Fig. 3B) with 7 unarticulated spines and 1 short seta on praecoxal arthrite. Coxa and basis fused, with 3 distal setae. Endopod represented by 1 seta. Exopod 1-segmented, with 2 apical setae.

Maxilla (Fig. 3C) with robust syncoxa bearing 2 endites; proximal endite small, with 1 large apical seta; distal endite cylindrical, with 3 apical setae, 1 of them modified. Allobasis drawn into strong claw with 1 midventral seta. Endopod represented by 3 subequal setae.

Maxilliped (Fig. 3D) subchelate. Syncoxa elongate, with concave outer margin and 1 outer subdistal seta. Basis slightly longer than syncoxa, with small outer patch of spinules and 2 inner longitudinal rows of small spinules. Endopodal claw slightly curved, almost as long as basis, with single proximal seta.

Leg 1 (Fig. 4A) with large coxa ornamented with row of small setules along inner and outer margins. Basis somewhat transversely elongated, with setules along entire inner margin and along proximal outer margin; inner seta reaching middle of second exopodal segment; outer seta about half length of inner seta. Exopod 3-segmented; first segment with

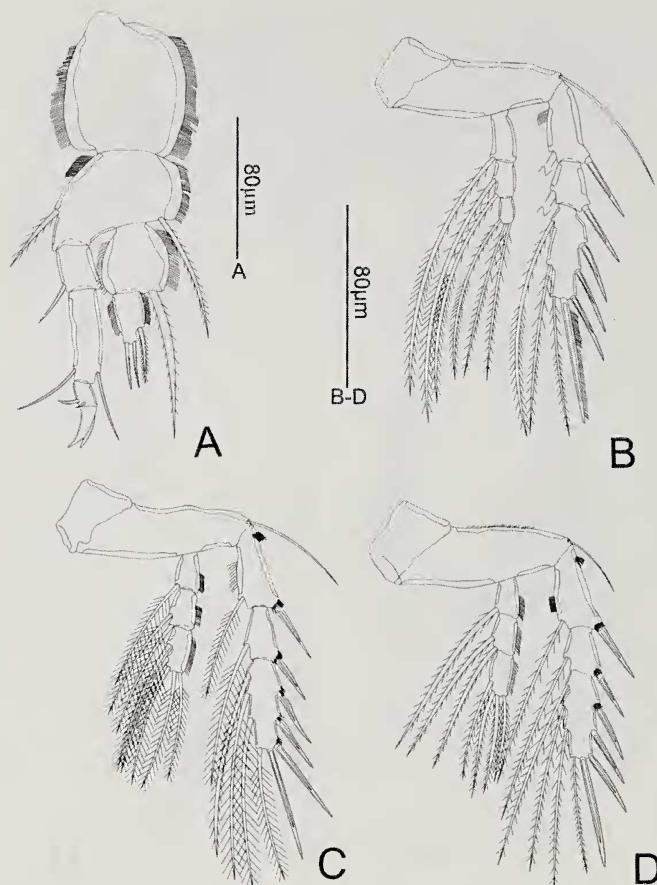


Fig. 4. *Peltidium camilae* n. sp., adult female. (A) Leg 1; (B) Leg 2; (C) Leg 3; (D) Leg 4.

outer spine; second segment longest, about 2 times as long as first segment, with outer subdistal spine and inner subdistal element; third segment with 2 subdistal and 2 distal claws. Endopod 2-segmented, shorter than exopod; first segment globose, with 1 long inner seta and row of short setules along inner and outer margins; second segment with 1 inner seta and 1 pinnate spine and 1 slender seta apically.

Legs 2 to 4 (Figs. 4B-D) with small coxa. Basis transversely elongated, with long outer seta. Rami 3-segmented. Endopod shorter than exopod. Armature of swimming legs 2-4 as in Table 1.

Table 1. Armature of swimming legs 2-4 (spines in Roman numerals, setae in Arabic) of *Peltidium camilae* n. sp. Sequence follows internal to external positions.

Leg	Exopod	Endopod
P2	1-I; 1-I; 2,1+I,III	1-0; 2-0; 1,2,0
P3	1-I; 1-I; 3,1+I,III	1-0; 2-0; 3,2,0
P4	1-I; 1-I; 3,1+I,III	1-0; 2-0; 2,2,0

Leg 5 (Fig. 1C) with distinct exopod and baseoendopod. Baseoendopod with outer basal seta issuing from long setophore; endopodal lobe with 2 unequal setae, 1 of them naked. Exopod slender, with 2 inner and 3 apical elements.

Male. Unknown.

Etymology. The species is named after the first author's daughter, Camila Varela Varona.

Remarks. *Peltidium camilae* n. sp. is attributed to Geddes' (1968) group B by the presence of five setiform elements on the P5 exopod, located either apically or on the inner edge. This group is composed of *P. angulatum* Thompson and Scott, 1903, *P. speciosum* Thompson and Scott, 1903, *P. perplexum* Thompson and Scott, 1903, *P. falcatum* Scott, 1909, *P. intermedium* Scott, 1909, *P. exiguum* Scott, 1909, *P. minutum* Scott, 1909, *P. hawaiiense* Pesta, 1935, *P. monardi* Pesta, 1935, *P. proximum* Nichols, 1941, *P. maldivianum* Sewell, 1940, *P. laudatum* Tanaka and Hue, 1966, *P. nichollsi* Geddes, 1968, *P. lernerri* Geddes, 1968, *P. quinquesetosum* Song and Yun, 1999, and *P. nayarit* Suárez-Morales and Jarquín-González, 2013. Amongst these, only three species are known from the Neotropical region. *Peltidium nichollsi* and *P. lernerri* were originally described from Exuma Cays, Bahamas (Geddes 1968), and *P. nayarit* is known from the state of Nayarit in the Eastern Tropical Pacific (Suárez-Morales and Jarquín-González 2013). For the distribution of the other species of the genus see Song et al. (2015) and Varela and Gómez (2013). *Peltidium camilae* n. sp. from the west coast of Florida, and the Bahamian species, *P. nichollsi* and *P. lernerri*, share three setae on P1 END2 and three, five and four setae, respectively, on the END3 of P2-P4.

Peltidium camilae n. sp. is more similar to *P. nichollsi* than to *P. lernerri* based on the shape of the setae on the second segment of the antennary exopod (with one strongly pinnate and two setiform elements in *P. nichollsi* and *P. camilae* n. sp., but with all elements setiform in *P. lernerri*), and the relative length of the P1 EXP1 (shorter than P1 EXP2 in *P. nichollsi* and *P. camilae* n. sp., but nearly as long as P1 EXP2 in *P. lernerri*). The new species can be further separated from the Bahamian species by the relative length of the END of P2-P4 (as long or slightly longer than the EXP in the Bahamian species, but shorter in the new species), relative length of the apical claws of the P1 EXP3 (as long as P1 EXP1 in the new species, longer than P1 EXP1 in *P. nichollsi*, and shorter than P1 EXP1 in *P. lernerri*), and relative length of the middle apical seta of the female P5 EXP (as long as the inner apical seta on P5 EXP in *P. camilae* n. sp., about half as long in *P. nichollsi*, and more than three times shorter in *P. lernerri*). Noticeable differences in the armature of the maxilliped were also detected, but they cannot be considered with confidence based on Geddes' (1968) descriptions of *P. nichollsi* and *P. lernerri*. For example, the absence of the seta on the maxillipedal syncoxa of *P. nichollsi* and *P. lernerri* is likely erroneous as this seta is present in other species of the genus including *P. camilae* n. sp. Also, the inner seta on the maxillipedal basis of *P. nichollsi* might actually be a long, slender spinule. Examination of type material of *P. nichollsi* and *P. lernerri* is needed to resolve this issue.

Acknowledgements

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Literature Cited

Boxshall, G.A., and S.H. Halsey. 2004. An introduction to copepod diversity. The Ray Society, London, 966 pp.

Geddes, D.C. 1968. Marine biological investigations in the Bahamas. 7. Harpacticoid copepods belonging to the families Porcellidiidae Sars, Peltidiidae Sars, and Tegastidae Sars. *Sarsia*, 35:9–56.

Song, J.S., H.-U. Dahms, P. Kangtia, S. Chullasorn, J. Ryu, and J.S. Khim. 2015. Description of a new species of the genus *Peltidium* Philippi, 1839 from southern Korea (Copepoda, Harpacticoida) – with a review of the genus. *Mar. Biol. Res.*, 11:516–527.

Suárez-Morales, E., and J. Jarquín-González. 2013. A new species of *Peltidium* Philippi, 1839 (Crustacea, Copepoda, Harpacticoida) from the Pacific coast of Mexico. *Zookeys*, 325:21–32.

—, J.W. Fleeger, and P.A. Montagna. 2009. Free living Copepoda (Crustacea) of the Gulf of Mexico. Pp. 841–869 in *Gulf of Mexico Origin, Waters, and Biota*. Vol. 1, Biodiversity (D.L. Felder, and D.K. Camp, eds.). Texas A&M University Press, Texas, 1312 pp.

Varela, C. 2005. Una nueva especie de *Peltidium* (Copepoda: Harpacticoida), de Cuba. *Solenodon*, 5:1–5.

—, and S. Gómez. 2013. Dos nuevas especies de la familia Peltidiidae Boeck, 1873 (Copepoda: Harpacticoida) de Cuba. *Novit. Caribaea*, 6:51–62.

Wells, J.B.J. 2007. An annotated checklist and keys to the species of Copepoda Harpacticoida (Crustacea). *Zootaxa*, 1568:1–872.